CLAIMS.

1. A method of designing a permanent magnetic structure for generating a desired magnetic field in a region of interest (ROI) comprising:

-setting the dimensions of the permanent magnetic structure

-setting a hypothetical distribution of magnetic material over the surface of said structure for each member of a finite set of spatial frequency harmonics of unit magnetisation amplitude

-calculating the magnetic field in the ROI from each member of said set

-calculating amplitudes of said harmonics by the method of least squares in order to achieve the optimum approximation to the desired field in the ROI

-scaling the members of said set according to said optimised harmonic amplitudes

-establishing, by summing said scaled members, the required distribution of magnetic material in order to generate the desired magnetic field.

2. A method according to claim 1 wherein the desired field represents a modification of an existing magnetic field.

3. A method according to claim 2 wherein the desired field represents the deviation from a required field generated by an existing magnetic structure.

4. A method according to claim 3 wherein the desired field represents one of the harmonics of the magnetic field over the ROI.

5. A method according to claim 4 wherein each said harmonic results in a shim, to create a set of shims representative of the weighted sum of the individual harmonics.

6. A method according to any of claims 1 to 5 wherein the desired field is produced by a distribution of magnetic material over one or more flat surfaces.

7. A method according to any of claims 1 to 5 wherein the desired field is produced by a distribution of magnetic material over an elliptical cylindrical shell.

8. A method according to any of claims 1 to 5 wherein the desired field is produced by a distribution of magnetic material over the surface of a circular cylindrical shell.

9. A method according to claim 7 or claim 8 wherein the thickness of magnetic material is varied in an azimuthal direction in accordance with the desired field.

10. A method according to claim 1 wherein the desired field is produced by a combination of paramagnetic and diamagnetic materials.

11. A method of designing a permanent magnetic structure for generating a desired magnetic field in a region of interest (ROI) on the basis of the minimization of the sum of the least squares of the deviations over the ROI.

12. A method according to any of claims 1-11 wherein an additional, hypothetical, arbitrary distribution of magnetic material over said surface is incorporated into said set.

13. A method according to claims 2 or 3 comprising:

-calculating the distribution of magnetic material to produce an optimum approximation to a desired magnetic field in the ROI, in accordance with the method described herein

-determining the total resultant field in the ROI taking into account the thicknesses and placements of magnetic materials involved

-calculating a corrected magnetic material distribution representative of the difference between said total resultant field and said desired field

-repeating the latter two steps until the field attained approximates the desired one in the ROI to a sufficient degree.

14. A method according to any of claims 1 to 5 where the magnetic fields of said set of harmonics are evaluated by an actual step involving numerical integration in real space.

15. A method according to any of claims 1 to 5 where the Fourier transformers of the magnetic fields of said set of harmonics are evaluated directly in Fourier Kernel space.

16. A permanent magnetic structure designed in accordance with the method of any of claims 1 to 15.